

Matter No.: 11019-029001  
Applicant(s): Donald E. Ackley  
MICRONEEDLE ARRAY SYSTEMS

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# Flip chip components

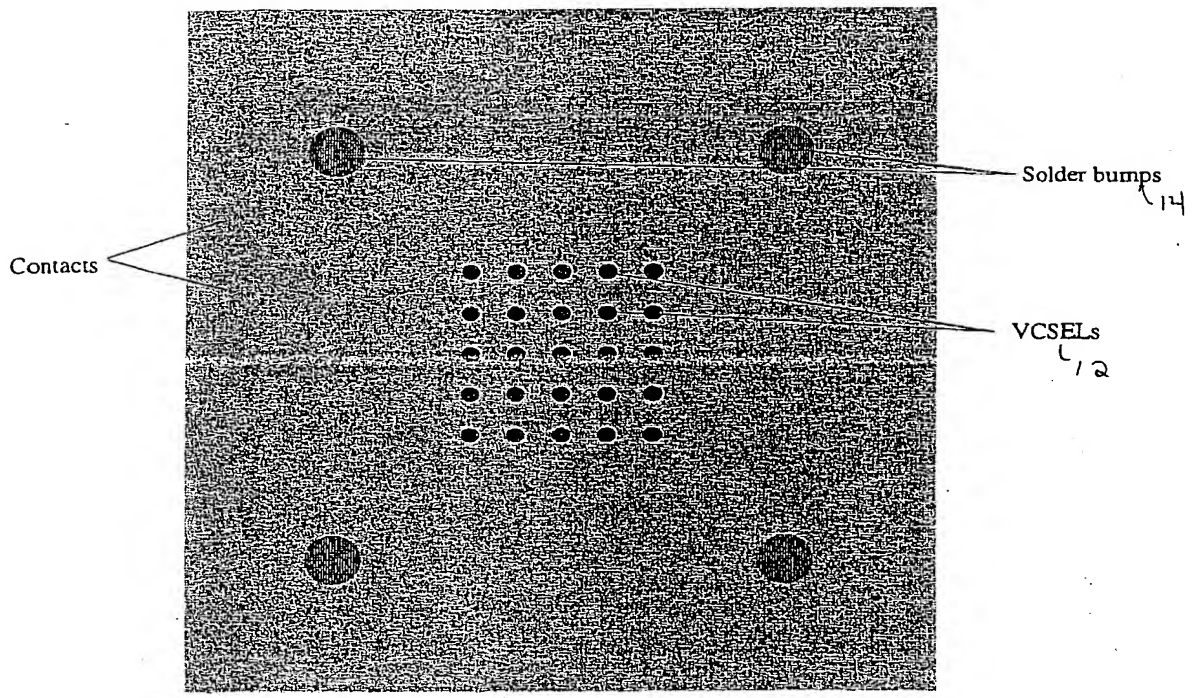


Figure 1A

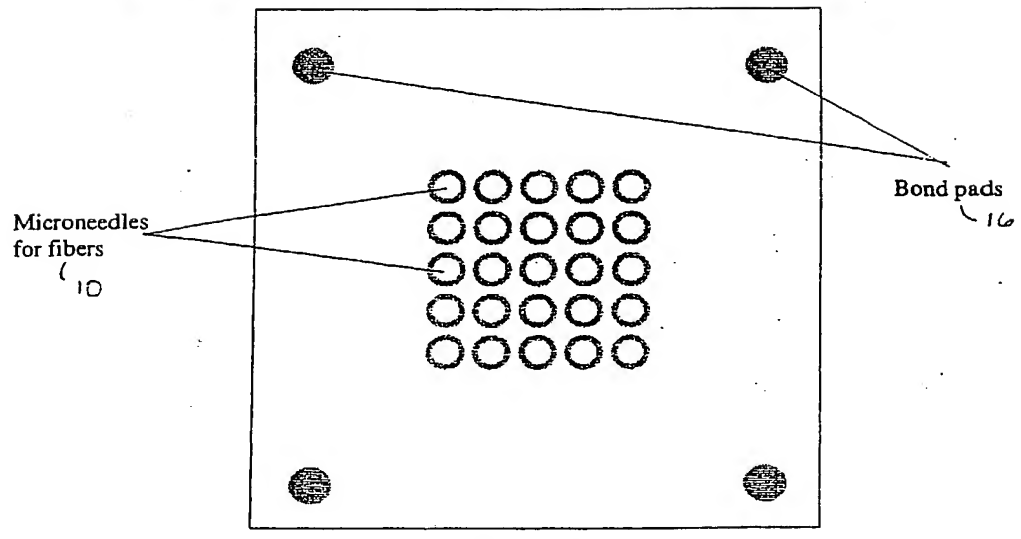


Figure 1B

## Flip Chip Assembly Drawing

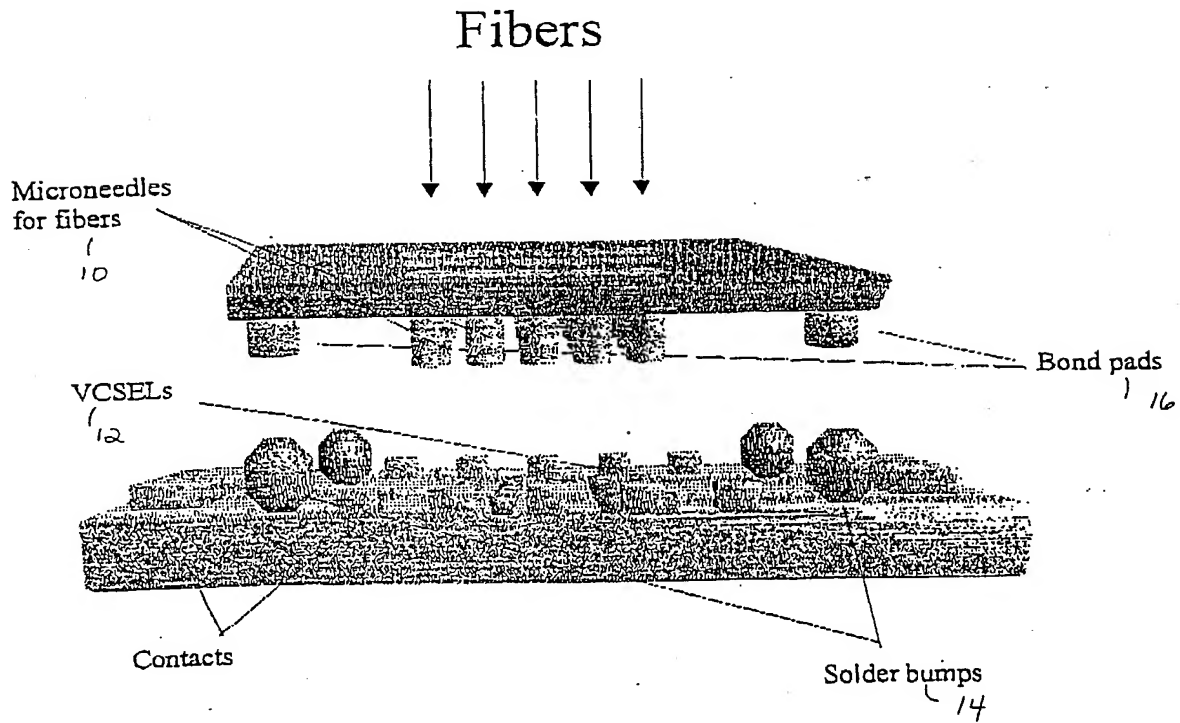


Figure 20

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### Metal Microneedle Fabrication Process

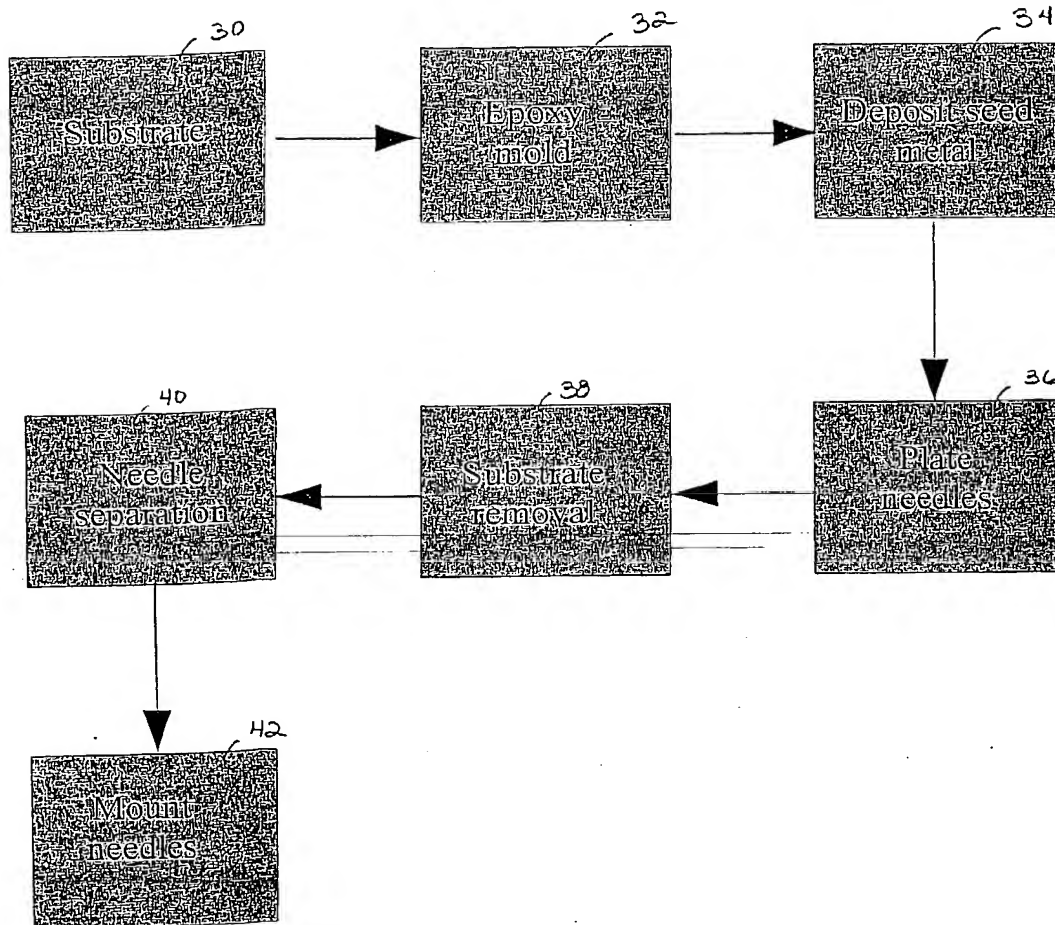


Figure 3A

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### Fiber/VCSEL Assembly Process

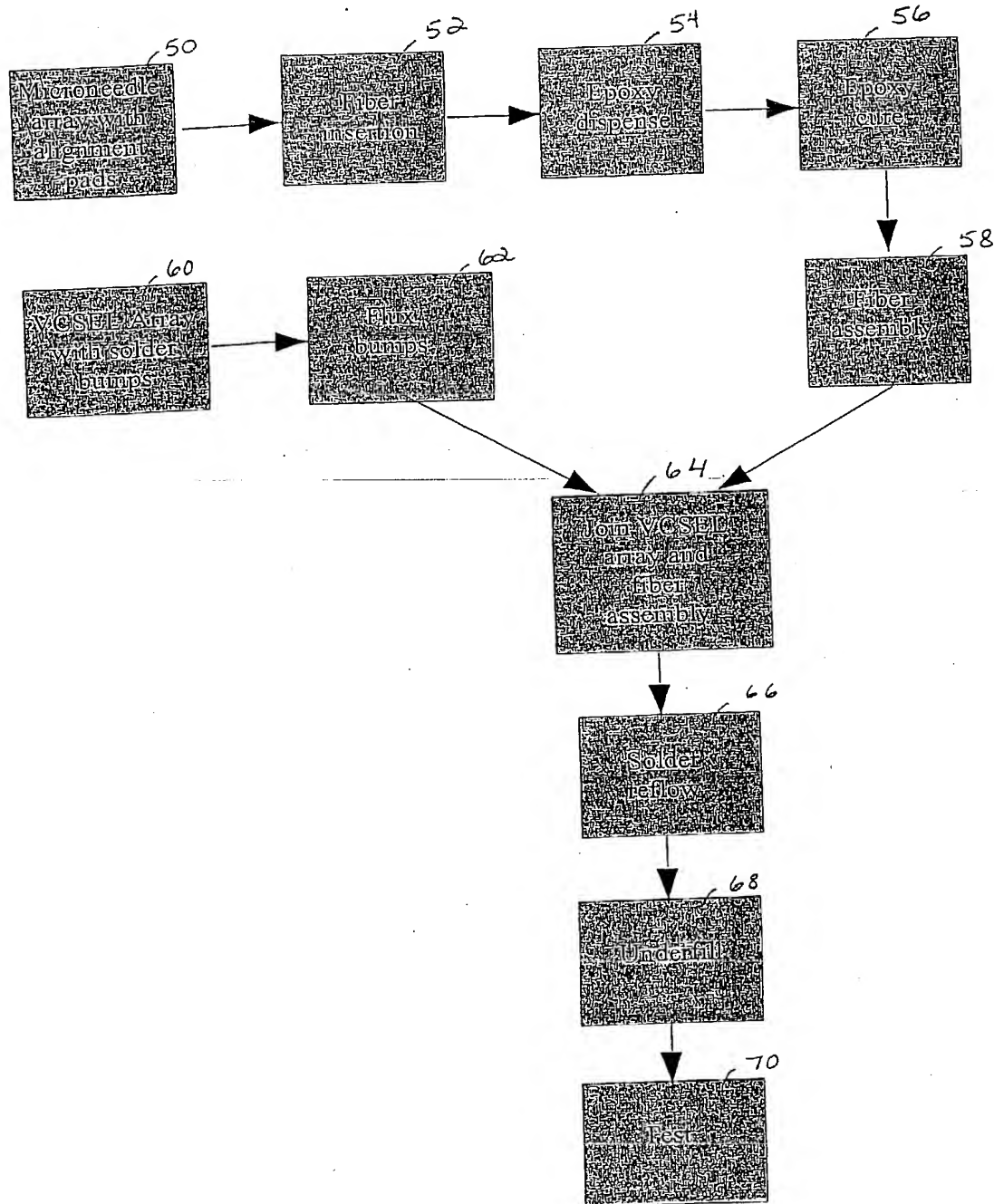


Figure 3B

## Fiber Assembly Cross-Sections

Fiber in Needles

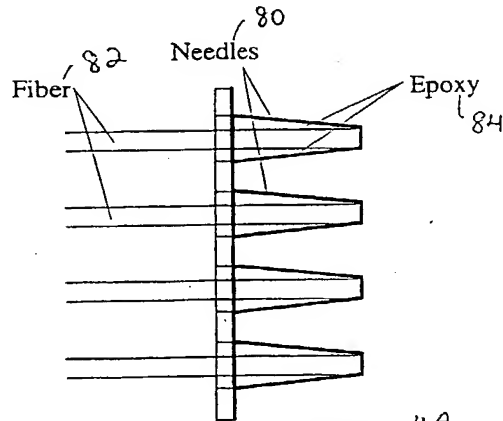


Figure 4A

Fiber w/ Epoxy Plug

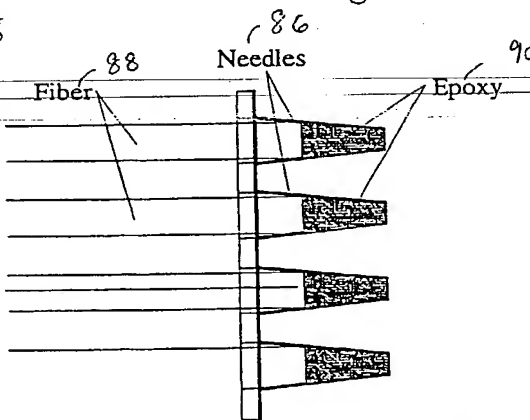


Figure 4B

Fiber w/ epoxy lens

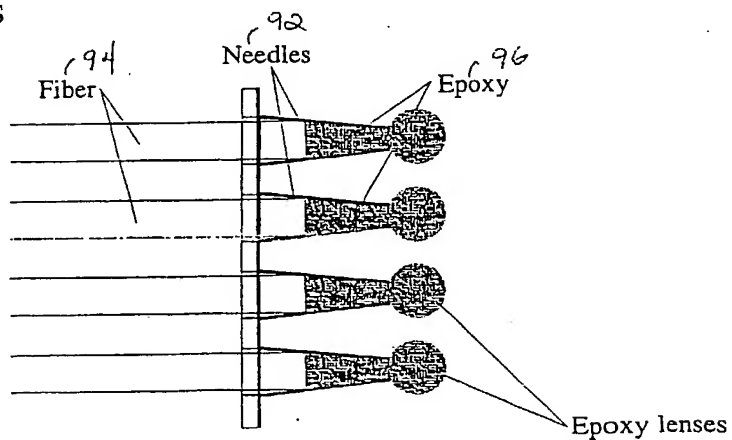


Figure 4C

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### Fiber w/ graded epoxy lens

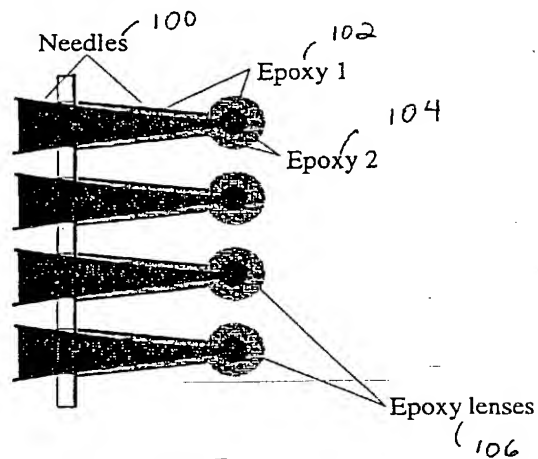


Figure 5

### Micro-extrusion

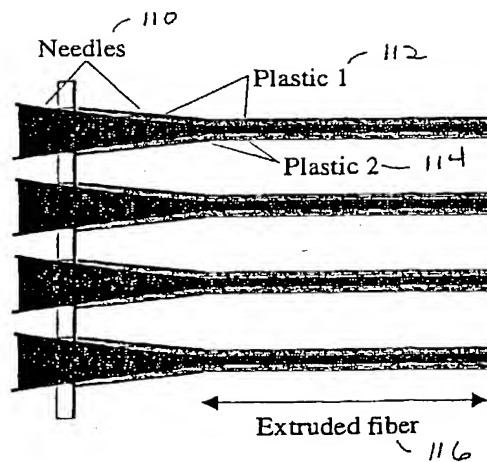


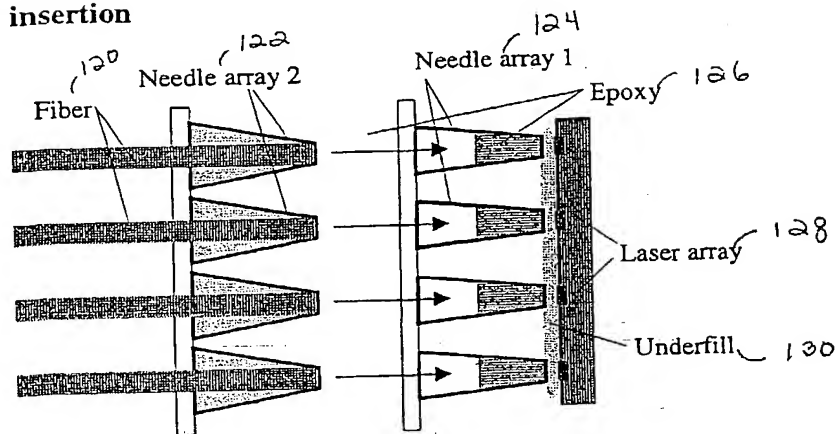
Figure 6

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## Connector-Fiber to Laser

Before insertion



Fiber assembly

Laser/PD assembly

Figure 7A

After insertion

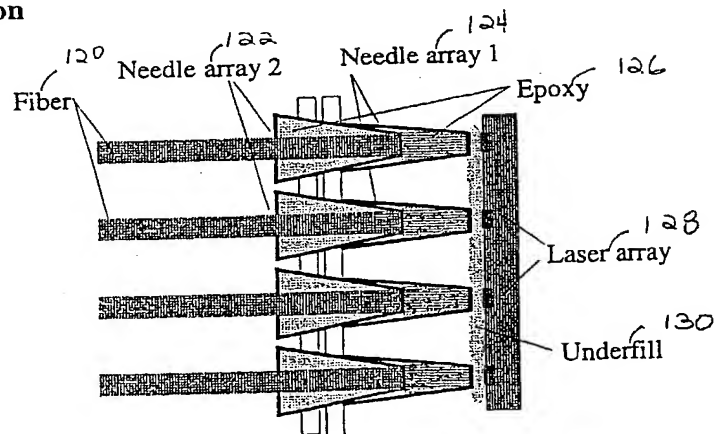


Figure 7B

### Lensed Fiber Connector

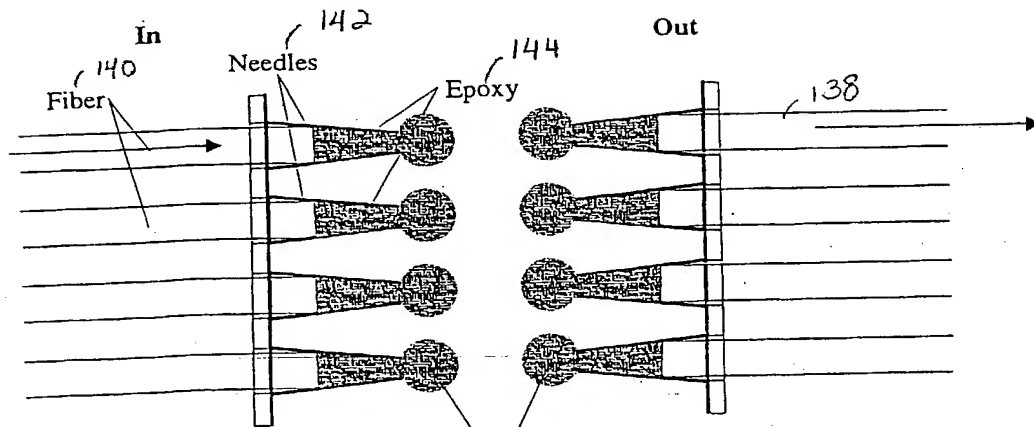


Figure 8

### Un-lensed Fiber Connector

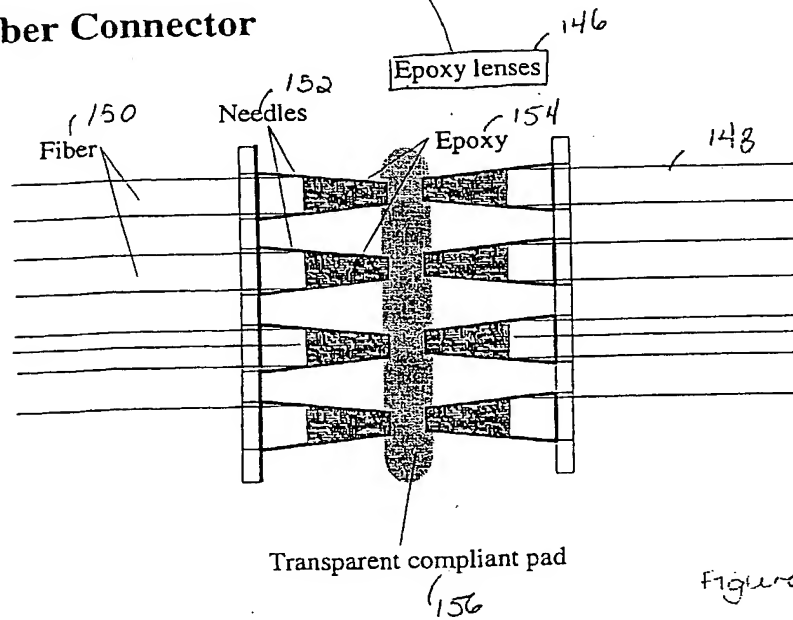


Figure 9



### Lensed Fiber Connector w/ Alignment Spacer

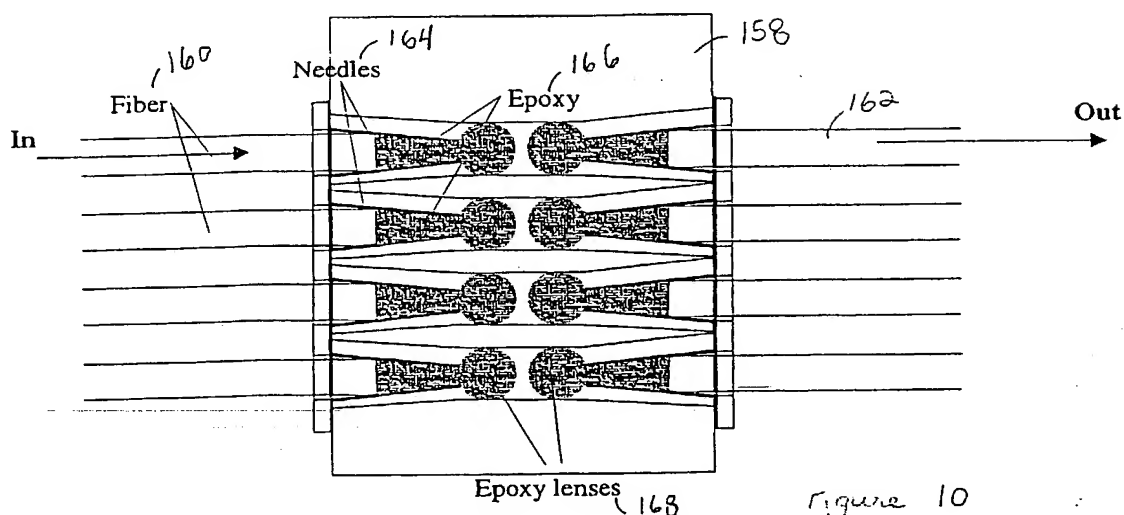


Figure 10

### Un-lensed Fiber Connector w/ Alignment Spacer

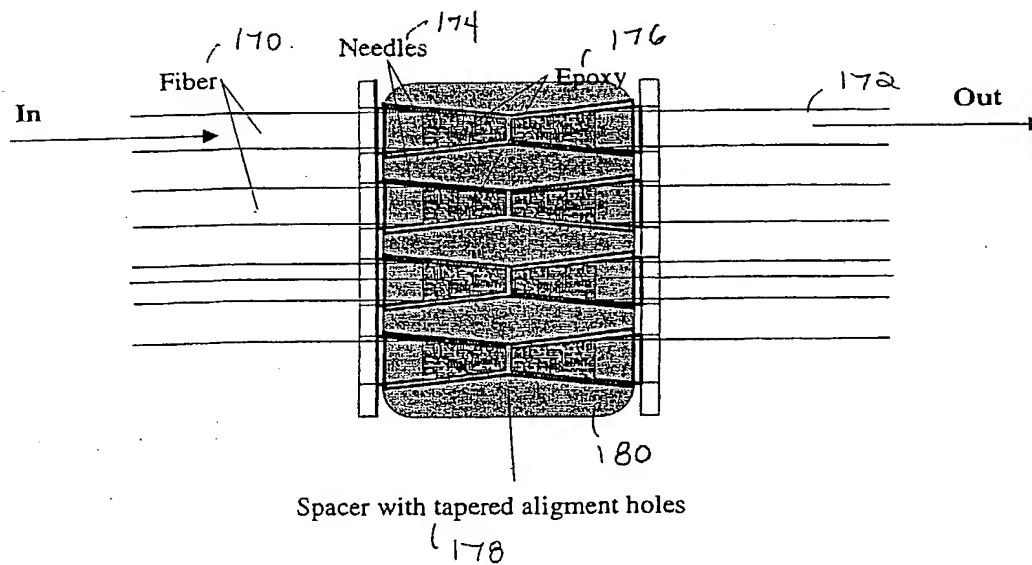


Figure 11

## Fiber w/ Sensor Plug

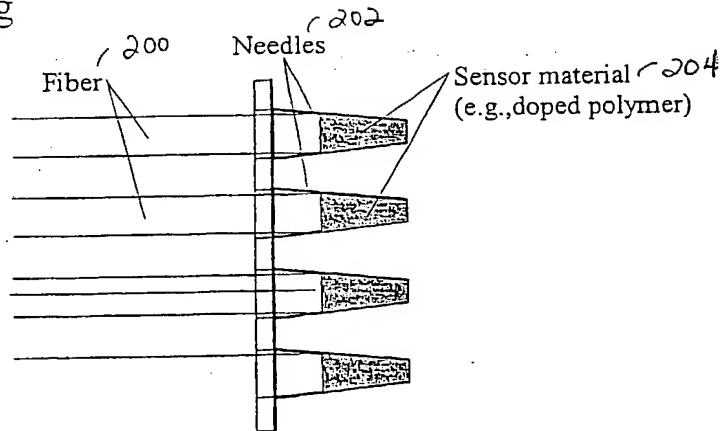


Figure 12A

## Fiber w/ lens-shaped sensor element

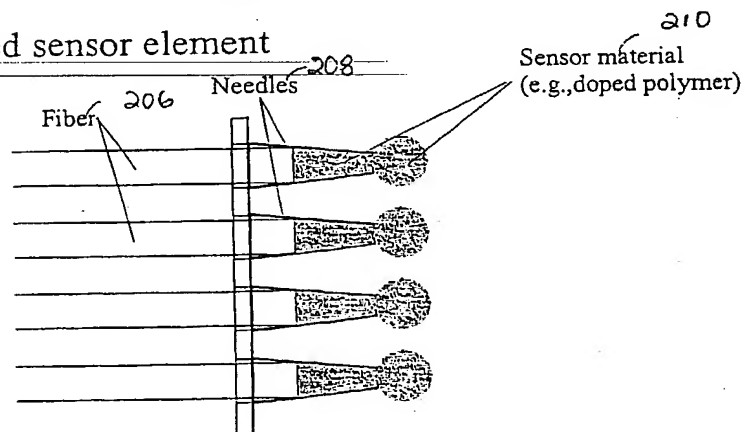


Figure 12B

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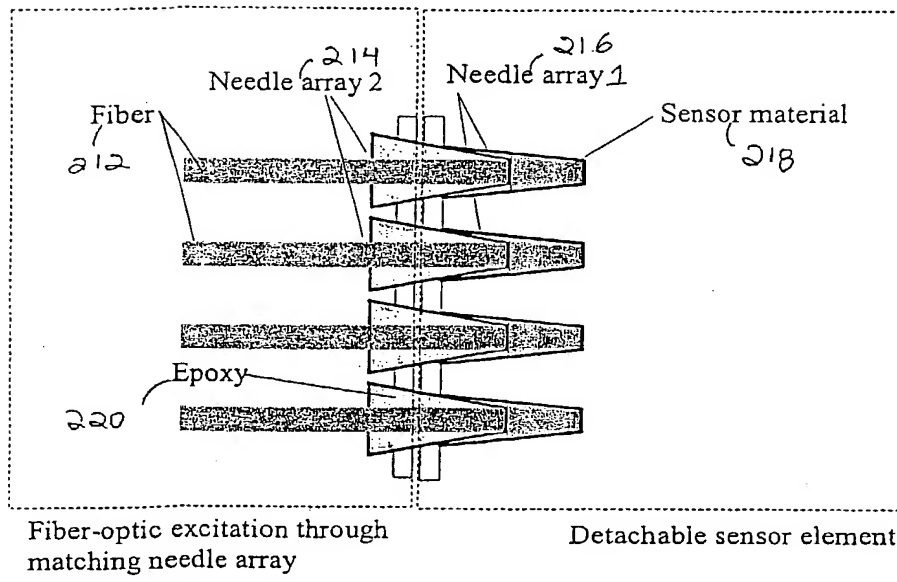


Figure 12C